(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 998 872 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.05.2000 Bulletin 2000/19

(51) Int. Cl.[7]: **A47L 15/42**, A47L 15/46

(21) Application number: **99117510.0**

(22) Date of filing: **04.09.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **02.11.1998 IT PN980079**

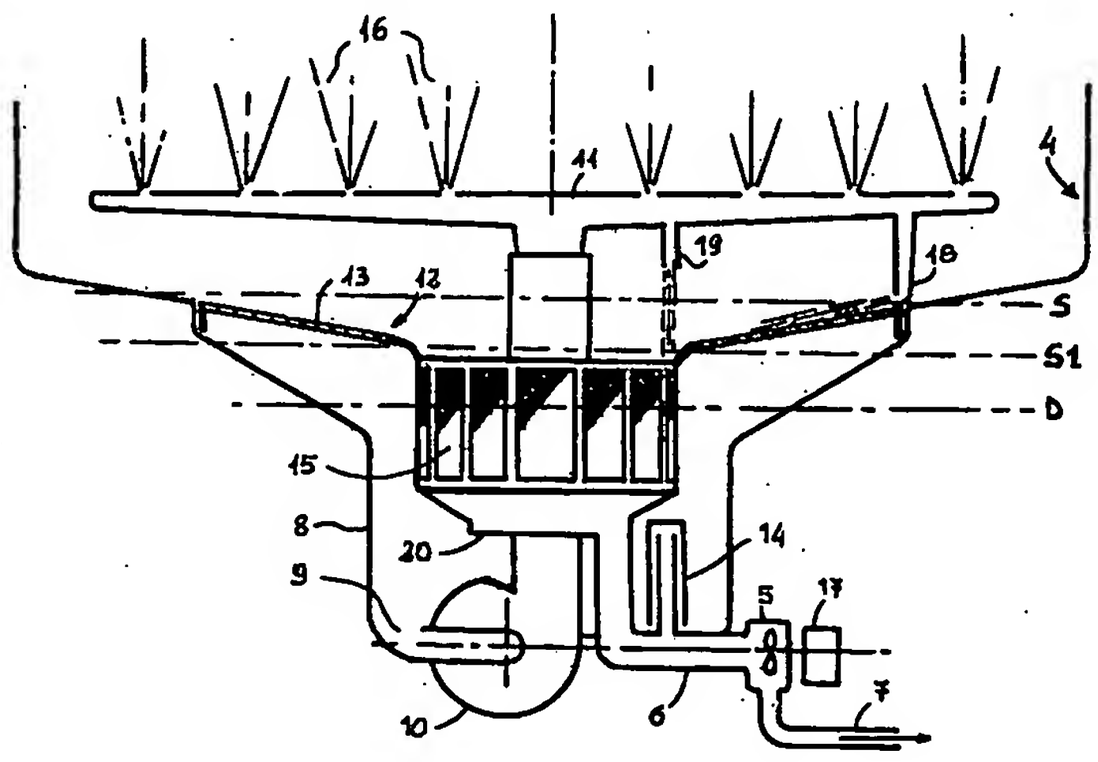
(71) Applicant:
Electrolux Zanussi S.p.A.
33170 Pordenone (IT)

(72) Inventor: **Favret, Ugo**
33072 Casarsa, Pordenone (IT)

(74) Representative:
Busca, Luciano et al
PROPRIA S.r.l.
Via Mazzini 13
33170 Pordenone (IT)

(54) Working programme for dishwashing machines

(57) In at least an operating phase of the programme, water is let into the washing vessel (4) up to a static level (S) which is higher than the level of a recirculation filter (12, 13), a recirculating pump (10) is switched on, the water is at a certain point let partially off the vessel down to a static level (S1) which is lower than the level of the filter (12, 13), and the recirculating pump is switched on again. The performance of the recirculation filter (12) is thereby improved.



EP 0 998 872 A1

Description

[0001] The present invention relates to a working programme for a dishwashing machine, said programme being so improved as to effectively enhance the overall performance of the machine.

[0002] Dishwashing machines are known to usually comprise a recirculation filter arranged in the path of a flow of water that is taken in by a recirculating pump to therewith supply means for spraying the washload items arranged in the washing vessel of the machine.

[0003] As described for instance in GB-B-2 225 224, such a filter preferably includes a substantially frusto-conical portion with an aperture connecting the interior of the washing vessel with the intake of a draining pump. To said recirculation filter there is further associated a substantially cylindrical or frusto-conical filtering member (the so-called "micro-filter") that usually extends downwards from said aperture with a particularly fine-meshed structure.

[0004] When the recirculating pump is operating (for instance during a washing phase), the level of the water on the bottom of the washing vessel is generally known to lower from a "static" value to a "dynamic" value, whereas it rises again to its above mentioned static value when the recirculating pump is de-energized, ie. does not operate, such as this occurs for instance during the pauses that may be provided during the washing phase.

[0005] During washing, heavier dirt particles contained in the water tend to deposit onto the bottom of the washing vessel, near the intake of a draining pump, from where they are then drained off. On the other hand, during the above mentioned pauses, the relatively light soil particles that are in suspension in the same water (the level of which is rising on the bottom of the washing vessel) tend to float and mount to said static level, so that they are anew affected by the intake action of the recirculating pump in a subsequent operating phase thereof. This of course reduces the efficiency of the filtering system of the machine and undesirably impairs the performance of the dishwasher as a whole. This problem is particularly felt in the preferred case in which the recirculating pump operates through a sequence of energization periods alternating with pauses, for instance in order to alternately supply the various rotating spray arms of the machine, as described in EP-B-0 237 994.

[0006] In view of at least diminishing the extent of such a problem the proposal has been made, as described for instance in the Italian utility model application no. PN98 U 000033 filed by the same Applicant, to appropriately arrange, upstream of the recirculation filter, a bell-shaped element adapted to trap the soil particles suspended in the water collecting on the bottom of the washing vessel. In this manner, the possibility is substantially limited for suspended soil particles to be again taken in by the recirculation pump after a pause period of the same. Such a solution, although effective, does not fully remove the therewith connected technical problem.

[0007] It should furthermore be noticed that a traditional washing programme of a dishwashing machine mainly includes a series of selectively excludable operating phases, ie. at least a pre-wash phase, at least a main wash phase, at least a rinse phase with cold water, and at least a final rinse phase with hot water (possibly added with rinsing aid) that facilitates the final drying of the washload items. Each one of these phases is carried out with water being first let into the washing vessel and the recirculation pump being energized, and ends with the recirculation pump being de-energized and the working liquor being let, ie. drained off the washing vessel. During draining, therefore, the working liquor on the bottom of the washing vessel usually decreases slowly fron the static level down to a minimum residual level, so that the suspended soil particles tend to deposit and settle on the recirculation filter, where they remain, and tend to dry up in the meantime, until the dishwashing machine is operated again. Under the circumstances, it can be easily appreciated that a subsequent operation of the dishwashing machine will of course carry with it the problem of an undesired clogging of the recirculation filter that affects the overall performance of the machine itself. This problem is particularly felt in the preferred case in which the recirculation pump and the drain pump of the dishwashing machine are driven by a same and single motor, as described for instance in EP-B-0 268 835.

[0008] It is a main purpose of the present invention to provide a working programme for dishwashing machines which is effective in substantially doing away with the soil-handling drawbacks that are typically to be founf in prior-art solutions, even in the preferred case in which the dishwashing machine comprises a single motor for driving both the recirculation pump and the drain pump and/or the recirculation pump is substantially operated at intervals.

[0009] More exactly, it is a purpose of the present invention to provide a working programme of the above cited kind which is effective is substantially doing away with the problems of an uneffective filtration of suspended soil particles and the clogging of the recirculation filter.

[0010] It is furthermore a purpose of the present invention to provide a working programme of the above cited kind which is implementable in a simple manner in an automatic dishwashing machine of a substantially traditional type, without any need for structural modifications to be made.

[0011] According to the present invention, these and further aims are reached in a working programme for dishwashing machines embodying the features as recited in the appended claims.

[0012] Anyway, characteristics and advantages of the present invention will become more readily apparent

from the description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a schematical, partial view of a dishwashing machine adapted to carry out a working programme according to the present invention; and

- Figures 2 and 3 are diagrammatical views illustrating schematically the variations in the water level and the flow rate of the recirculation pump, respectively, in an operation phase of the programme according to the present invention, as referred to a simple embodiment thereof.

[0013] With reference to Figure 1, the dishwashing machine is of a traditional automatic type and comprises mainly a washing vessel 4 (shown only partially) provided on its lower side with a sump 8 collecting the working liquor (hereinafter named "water" for reasons of greater simplicity), the intake section 9 of a recirculation pump 10 being in communication with the bottom of said sump. This recirculation pump is adapted to supply with water at least a rotating spray arm 11, or the like, for spraying the washload items.

[0014] The washing vessel 4 is provided with a drain circuit formed by a drain pump 5 with an intake pipe 6 and a delivery pipe 7. In a per sè known manner, the intake pipe 6 may be connected to the bottom of the sump 8 via a siphon-like arrangement 14 adapted to enable the same sump to become completely empty in the water draining phases.

[0015] Underneath the spray arm 11, the vessel 4 also accomodates a recirculation filter 12 arranged in the path of a flow of water that is taken in by the pump 10 in order to be sprayed onto the washload items through the rotating spray arm 11, and that falls back again by gravity into the sump 8 where it collects.

[0016] In the example being described here, the filter 12 comprises a substantially plane portion 13 (having preferably a slightly frusto-conical shape) that joins with a substantially cylindrical (or frusto-conical) portion 15 extending downwards all the way to a wall 20. The latter joins in turn with the intake pipe 6 of the dram pump 5.

[0017] In a preferred manner, the portion 15 of the recirculation filter has a particularly fine mesh (the so-called "microfilter") and both portions 13 and 15 are substantially concentric to the axis of rotation of the rotating spray arm 11.

[0018] The washing vessel 4 is adapted to be supplied with water through a water circuit of a per sè known type (not shown).

[0019] The recirculation pump 10 and the drain pump 5 are preferably driven by a single reversible electric motor 17 and are made and arranged as described in the afore cited EP-B-0 268 835.

[0020] Furthermore, the rotating spray arm 11 is preferably provided with auxiliary spray nozzles 18 and 19 which, when the recirculation pump 10 is operating, are adapted to direct towards the portions 13 and 15 of the recirculation filter 12 respective tangential water jets that are effective in automatically cleaning said portions, such as this is for instance described in GB-B-2 204 482.

[0021] In a per sè known manner, the working programme according to the present invention comprises at least a phase in which water is let into the vessel 4, the recirculation pump 10 is operated temporarily, and the pump 5 is eventually operated to let said water off the washing vessel. In particular, the programme may mainly comprise, in a sequence, the following selectively excludable operation phases: at least a pre-wash phase, at least a main wash phase, at least a rinse phase with cold water, and at least a final rinse phase with hot water (possibly added with rinsing aid) that facilitates the final drying of the washload items. Most obviously, the dishwashing machine also comprises (per sè known and not shown) means adapted to heat up the water, while all main operational members and component parts of the dishwashing machine are controlled by a programme sequence control device (not shown, either, for reasons of greater simplicity).

[0022] Referring also to Figures 2 and 3, an embodiment of one of the above cited phases included in the working programme according to the present invention, in particular the final rinse with hot water, will be described below.

[0023] At an instant t0, an amount of water is let into the washing vessel and this water collects in the sump 8 until it reaches a normal static level S (Figures 1 and 2) that is substantially higher than or equal to the level up to which the filter 12 , and in particular the substantially plane portion 13 thereof, extends.

[0024] At an instant t1, the pump 10 is then energized so as to enable it to supply the rotating spray arm 11 at a pre-determined water flow rate P0 (Figure 3). As a result, the rotating spray arm 11 produces water jets 16 that are capable of showering the washload items, thereby exerting an effective mechanical soil-removing action over them. Correspondingly, the level of the water in the sump 8 decreases to a dynamic level D and the water circulating inside the vessel 4 is filtered by the filter 12, from which the retained soil particles are then sent to the drain 6 by the action of the afore cited auxiliary nozzles 18 and 19.

[0025] During the final rinse phase being described here, the water is preferably added with rinsing aid and heated until it reaches a pre-determined final temperature, eg. 65°C.

[0026] During a transient period t3 - t4, which preferably takes place in advance of the rinsing aid addition to the water and when the same water has reached a temperature of say, 50°C, the water in the vessel 4 is in part let off by means of the pump 5, so that a reduced amount of water Q remains actually in the same vessel.

In a preferred manner, at a preceding instant t2 the recirculation pump 10 is temporarily de-energized.

[0027] According to a feature of the present invention, the above cited reduced water amount Q (which ican anyway be easily determined by those skilled in the art) is such that, in a condition in which the recirculation pump 10 is de-energized, the water in the sump 8 is able to rise to a static level S1 which is substantially lower than not only the afore mentioned static level S, but also the level up to which the filter 12, and in particular the substantially plane portion 13 thereof, extends.

[0028] The above mentioned condition of de-energization of the pump 10 also occurs at an instant t5, which precedes an instant t6 at which the pump 5 is energized for the final drain, ie. definitely letting off the residual water from the sump 8.

[0029] Furthermore, such conditions of de-energization of the pump 10 may also occur throughout the periods t1 - t2 and t4 - t5 in the preferred case in which the pump itself operates with a sequence of energizations alternating with pauses, for instance to supply the rotating spray arm 11 in a pulsed manner or to alternately supply several rotating spray arms, as described in EP-B-0 237 994. For reasons of greater simplicity, such a cyclic operation of the pump 10 is not represented in Figures 2 and 3.

[0030] In a preferred manner, when (during the period t4 - t6 subsequent to the partial water let-off) the afore cited reduced water amount Q is present in the vessel 4, the recirculation pump 10 is operated at a reduced flow rate P1. This may be obtained in a number of ways, but preferably by correspondingly decreasing the rotation speed of the pump 10, so as described for instance in IT-A-1 256 273, and is aimed at preventing the pump itself from undesirably unpriming and, therefore, generating hydraulic noise.

[0031] As a result of said reduced water amount Q present in the washing vessel, as well as said reduced flow rate P1 of the recirculation pump 10, the dynamic level D of the water in the sump 8 is able to remain substantially unchanging.

[0032] It should on the other hand be noticed that, in the period t4 - t5, the washload items do not require being sprayed with high-pressure water jets 16, since is is in fact sufficient for such jets to simply hit the same washload items so as to rinse them and, possibly, heat them up properly.

[0033] It will of course be appreciated that the amount of energy required to heat up such a reduced water quantity Q is correspondingly low, in the same way as advantageously reduced is the amount of rinsing aid that must be added to the water.

[0034] Important is anyway the fact that, after the afore cited partial water let-off, the water in the sump 8 is no longer able to rise again up to the level of the filter portion 13, so that, unlike what happens usually, the small or tiny soil particles that have previously been retained by the recirculation filter, are not brought again in counter-flow, through the portion 13, upstream of the same recirculation filter 12.

[0035] A further important advantage derives from the fact that the water in the sump 8 lies below the filter 13 at the instant t6, when the pump 5 is energized to carry out the final water drain, ie. completely let off the water at the end of the cycle. This means that soil particles floating in the water, whose level in the sump 8 slowly decreases until the same sump is eventually empties completely, are not able to deposit or settle on the filter portion 13 thereabove, which therefore remains advantageously clean.

[0036] The above described operation is particularly advantageous in the final rinse phase with hot water, as illustrated above, but it can be advantageously used in a substantially same manner in all other possible phases (ie. pre-wash, main wash, cold-water rinse) included in the working programme according to the present invention, with the sole difference that in some of these phases the water may be heated up to a different temperature or it may even not be heated at all.

[0037] It will be appreciated that the afore described working programme may be the subject of a number of modifications without departing from the scope of the present invention.

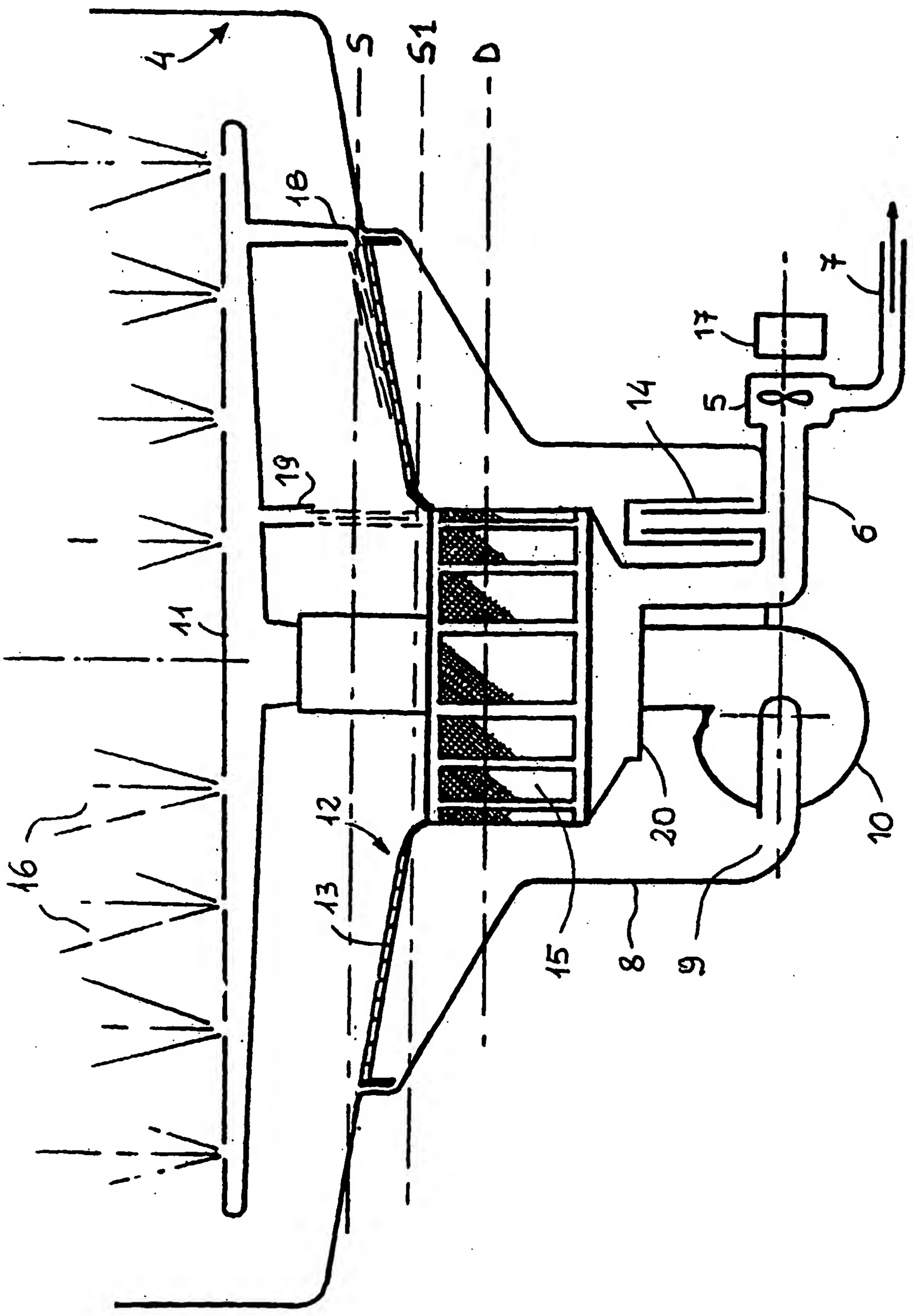
Claims

1. Working programme for an automatic dishwashing machine, comprising at least an operating phase in which water is first let into a washing vessel to be then recirculated by a recirculation pump and finally let off the washing vessel completely. filtering means arranged in the path of a water flow generated by said recirculation pump extending in said washing vessel up to substantially a certain level, characterized in that the water is let into the washing vessel (4) in such amount as to be able to reach, under de-energization conditions of the pump (10), a first static level (S) which is substantially higher than or equal to the level reached by said filtering means (12, 13), the water being partially let off during said operating phase so that a such a reduced amount of water (Q) remains in the washing vessel (4) as to enable it to reach, under de-energization conditions of the pump (10), a second static level (S1) which is substantially lower than the level reached by said filetring means (12, 13).

2. Working programme according to claim 1, characterized in that before and after said water being so partially let off (t3 - t4), the recirculation pump (10) is operated at a pre-determined flow-rate (P0) and at a reduced flow-rate (P1), respectively.

3. Working programme according to claim 1, characterized in that to carry out a final rinse phase the

water is added with rinsing aid after said partial water drain (t3 - t4).


4
S
S1
D
18
19
11
16
12
13
15
8
9
17
3
14
5
6
20
10

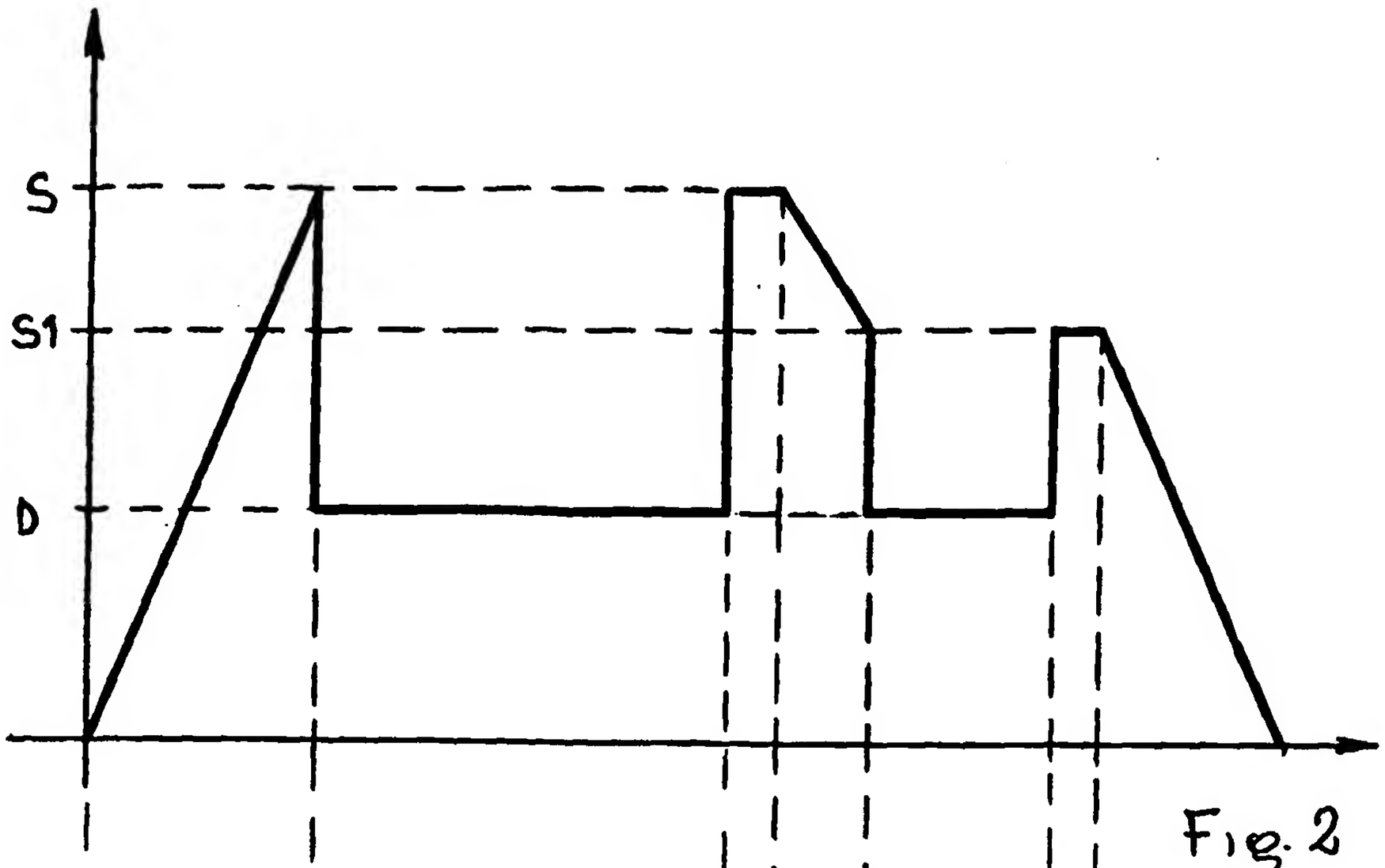


Fig. 2

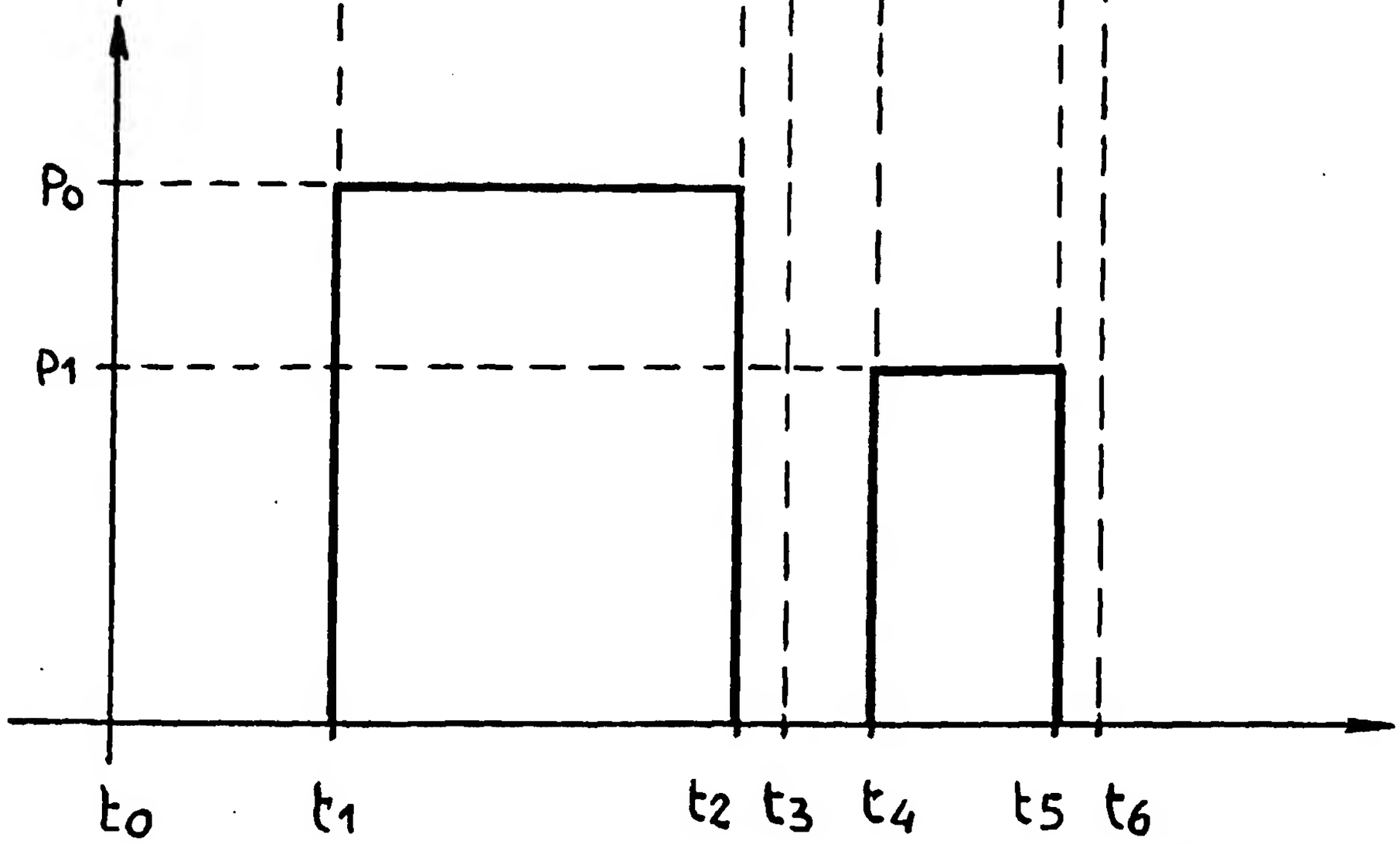


Fig. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 11 7510

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 317 990 A (ABB CYLINDA AB) 31 May 1989 (1989-05-31) * column 1, line 6 - line 38 *	1	A47L15/42 A47L15/46
A	* column 5, line 31 - column 6, line 40; claims 1,6,11; figures *	2	
A	FR 2 374 822 A (LICENTIA PATENT-VERWALTUNGS-GMBH) 13 July 1978 (1978-07-13) * page 1, line 15 - line 26 * * page 2, line 11 - line 25; figure *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 February 2000	Courrier, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 11 7510

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-02-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 317990 A	31-05-1989	SE 459554 B	17-07-1989
		AU 2576888 A	01-06-1989
		DE 3870414 A	27-05-1992
		SE 8704705 A	27-05-1989
		US 5097855 A	24-03-1992
FR 2374822 A	13-07-1978	DE 2657764 A	22-06-1978
		ES 465036 A	01-10-1978
		IT 1088829 B	10-06-1985
		SE 7714285 A	21-06-1978